Reinforcing Flow Experience in Self-assessment Testing through Employing Neurofeedback Techniques

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Outline

1. Computerized Testing
2. Flow Theory
3. Arousal Theory
4. Stress Theory
5. Instrument
6. Method
7. Experiments
8. Results
1. Computerized Testing

• Test System:
  – Item Analysis: Correct Rate, IRT, MIRT
  – Item Selection: Teacher’s Profession, Algorithms
  – Ability Evaluation: Efficiency, Accuracy
1. Computerized Testing

• Computerized Testing
  – Test Tools
    • Doing Test, Marking Test Paper, Storing Results
  – Self-assessment
  – Adaptive Testing
  – Online Testing / Assessment
    • Web-based
  – System Decoration
    • Visualization, Message Types, Feedback, Availability, Usability
2. Flow Theory

• In positive psychology, flow, also known as zone, is the mental immersed in a feeling of energized focus, full involvement, and

• does.

• Flow is a pleasurable state of high productivity which can occur either during work or play.

2. Flow Theory

the task that they have to do, then they enter the flow state.

– When the task is too easy, they become bored.
– When the task is too hard, they become anxious.
– When it's just right, they experience flow.
2. Flow Theory

- The hallmark of flow is a feeling of spontaneous joy, even rapture, while performing a task although flow is also described as a deep focus on nothing but the activity – not even oneself or one's emotions (Goleman, 1996).

3. Arousal Theory

- Yerkes and Dodson (1908) developed an empirical relationship between arousal and performance, which named the Yerkes-Dodson law.
- This law indicated that a person’s performance increased with mental arousal, but if the levels of arousal became too high, his/her performance decreased.
3. Arousal Theory

Yerkes-Dodson Human Performance Curve
4. Stress Theory

- Cox and MacKay (1976) redefined the law by emphasizing the psychological phenomenon of the stress.
  - If a person's stress is too low, he/she may feel boring.
  - Oppositely, if a person's stress is too high, he/she may break down.

- There exists a best performance that can be found under certain ranges of stress levels. When a person is in a state of flow, his/her performance is at the top of the performance curve (Payne, 2005).

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4. Stress Theory

[Diagram showing the relationship between performance and stress, indicating that performance is highest at moderate stress, with extremes leading to boredom and anxiety.]
5. Instrument

- Neurosky Mindware Mobile
  - *ThinkGear*

**eSense:** Attention & Meditation  
**EEG Spectrum:** $\delta$, $\theta$, $\alpha$, $\beta$, $\gamma$  
**RAW Data:** 512 Hz  
**Eye Blink**

Pictures from: http://neurogadget.com/2012/12/20/neurosky-mindwave-mobile-review/6611
5. Instrument

• Advantages
  – **Simple Data:** Attention, Meditation …
  – **Easy to Setup:** Dry Electrode, Easy to Wear …
  – **Mobility:** Bluetooth, Network …
  – **Software Support:** Useful, Funny …
  – **Programmable**

• Shortcomings
  – Only One Channel
  – **Data & Sample Lose:** Electrode Leaves skin
  – **High Power consumptive:** AAA Battery (5 hrs)
  – **Uncomfortable:** Earlobes Hurt, Too Big Head …
6. Method
7. Experiments

Participants
(n = 15)

On-line Questionnaires (3 minutes)
Computer Ability & Usage

Easy Level Test (5 minutes)

1st Round

On-line Questionnaires (5 minutes)
Flow State, AEQ, & Cognitive Load

Rest (3 minutes)

Difficult Level Test (5 minutes)

2nd Round

On-line Questionnaires (5 minutes)
Flow State, AEQ, & Cognitive Load

Measuring the Attention / Meditation
7.1 Test System Screenshot

1. 20世紀時，美國科羅拉多河流域的土地侵蝕速率，比16至18世紀的平均值增加大約6倍。當地土壞侵蝕率的增加，與下列哪項經濟活動關係最密切？

- 露天開採煤礦
- 放牧飼養牛隻
- 採伐天然森林
- 機械耕種小麥

PoolSignal: 0
Attention: 48
Meditation: 75
Blink: 0
Time: 2015-06-15 11:18:18
7.2 Experimental Pictures
8. Results

15 Testees (Mean Age = 25.0667, SD = 3.01109)

<table>
<thead>
<tr>
<th>Computer Skills &amp; Usages</th>
<th>n = 15</th>
<th>Mean</th>
<th>SD</th>
<th>&gt;= 4 (%)</th>
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<tbody>
<tr>
<td>1. I often use the computer.</td>
<td>15</td>
<td>4.87</td>
<td>0.36</td>
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<tr>
<td>2. I am adept at using computers.</td>
<td>15</td>
<td>4.47</td>
<td>0.52</td>
<td>100.00</td>
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<td>3. I often use the Internet.</td>
<td>15</td>
<td>4.93</td>
<td>0.26</td>
<td>100.00</td>
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<td>4. I am adept at using the Internet.</td>
<td>15</td>
<td>4.80</td>
<td>0.41</td>
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<td>5. I often use computers for learning.</td>
<td>15</td>
<td>4.27</td>
<td>0.96</td>
<td>80.00</td>
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<td>6. I am adept at using computers for learning.</td>
<td>15</td>
<td>3.93</td>
<td>0.89</td>
<td>73.33</td>
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<td>7. I often use the computer test.</td>
<td>15</td>
<td>3.20</td>
<td>1.08</td>
<td>40.00</td>
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<tr>
<td>8. I am adept at using the computer test.</td>
<td>15</td>
<td>3.33</td>
<td>0.98</td>
<td>46.67</td>
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## 8. Results

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>n</th>
<th>SD</th>
<th>SEM</th>
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<tbody>
<tr>
<td><strong>Attention Easy</strong></td>
<td>53.1333</td>
<td>15</td>
<td>6.30042</td>
<td>1.62676</td>
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<td><strong>Attention Difficult</strong></td>
<td>54.0667</td>
<td>15</td>
<td>8.16322</td>
<td>2.10773</td>
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<tr>
<td><strong>Meditation Easy</strong></td>
<td>46.6667</td>
<td>15</td>
<td>9.02114</td>
<td>2.32925</td>
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<tr>
<td><strong>Meditation Difficult</strong></td>
<td>44.0000</td>
<td>15</td>
<td>9.03960</td>
<td>2.33401</td>
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<table>
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<th>Mean</th>
<th>SD</th>
<th>SEM</th>
<th>LB</th>
<th>UB</th>
<th>t</th>
<th>DF</th>
<th>Sig. (Two Tails)</th>
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<tr>
<td><strong>Attention Easy - Difficult</strong></td>
<td>-.93333</td>
<td>9.23090</td>
<td>2.38341</td>
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<td><strong>Meditation Easy - Difficult</strong></td>
<td>2.66667</td>
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<td>.169</td>
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The End~
Q & A